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Docket No.: GNCA-P02-007

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re Application of:

Beach, et al.

Serial No: 09/866,557

Filed: May 24, 2001

For: Methods and Compositions for RNA Interference

Art Unit: 1632

Attorney Docket No. GNCA-P02-007

Examiner: Not Yet Assigned.

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to Assistant Commissioner for Patents, Washington, D.C. 20231

on November 13, 2001
Date


Brent LaBarge

TRANSMITTAL OF SEQUENCE LISTING IN COMPUTER READABLE FORM

IN COMPLIANCE WITH 37 C.F.R. §§1.821(c), (e) AND 1.825(a), (b)

Box Sequence
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

This amendment is submitted in response to the Notice to File Missing Parts of Nonprovisional Application mailed from the Patent Office on August 17, 2001.

Transmitted herewith is a copy of a "Sequence Listing" in paper form for the above-identified patent application as required by 37 C.F.R. §§ 1.825(a) and 1.821(c), and a copy of the "Sequence Listing" in computer readable form as required by 37 C.F.R. §§ 1.825(b) and 1.821(e).

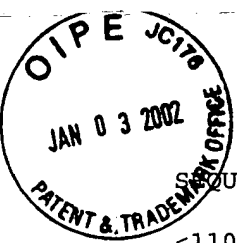
As required by 37 C.F.R. § 1.825(b), Applicant's Agent hereby states that the contents of the "Sequence Listing" in paper form and in the computer readable form submitted herewith are the same and, as required by 37 C.F.R. § 1.825(a), also states that the submission includes no new matter.

Respectfully submitted,

ROPES AND GRAY

By 

David P. Halstead
Registration No. 44,735
Telephone (617) 951-7615
Facsimile (617) 951-7050



SEQUENCE LISTING

<110> Hammond, S.
Hannon, G.
Beach, D.

<120> METHODS AND COMPOSITIONS FOR RNA INTERFERENCE

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<141> 2001-05-24

<150> 60/189,739
<151> 2000-03-16

<150> 60/243,097
<151> 2000-10-24

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<170> PatentIn version 3.1

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1340						1345								1350
Ser Asn	Cys Asn	Leu Tyr	Arg Leu	Gly Lys	Lys Lys	Gly Leu	Pro							
1355						1360								1365
Ser Arg	Met Val	Val Ser	Ile Phe	Asp Pro	Pro Val	Asn Trp	Leu							
1370						1375								1380
Pro Pro	Gly Tyr	Val Val	Asn Gln	Asp Lys	Ser Asn	Thr Asp	Lys							
1385						1390								1395
Trp Glu	Lys Asp	Glu Met	Thr Lys	Asp Cys	Met Leu	Ala Asn	Gly							

1400														
Lys	Leu	Asp	Glu	Asp	Tyr	Glu	Glu	Glu	Asp	Glu	Glu	Glu	Glu	Ser
1415						1420				1425				
Leu	Met	Trp	Arg	Ala	Pro	Lys	Glu	Glu	Ala	Asp	Tyr	Glu	Asp	Asp
1430						1435					1440			
Phe	Leu	Glu	Tyr	Asp	Gln	Glu	His	Ile	Arg	Phe	Ile	Asp	Asn	Met
1445						1450					1455			
Leu	Met	Gly	Ser	Gly	Ala	Phe	Val	Lys	Lys	Ile	Ser	Leu	Ser	Pro
1460						1465					1470			
Phe	Ser	Thr	Thr	Asp	Ser	Ala	Tyr	Glu	Trp	Lys	Met	Pro	Lys	Lys
1475						1480					1485			
Ser	Ser	Leu	Gly	Ser	Met	Pro	Phe	Ser	Ser	Asp	Phe	Glu	Asp	Phe
1490						1495					1500			
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1505						1510					1515			
Ala	Val	Glu	Glu	Asp	Asp	Phe	Val	Val	Gly	Phe	Trp	Asn	Pro	Ser
1520						1525					1530			
Glu	Glu	Asn	Cys	Gly	Val	Asp	Thr	Gly	Lys	Gln	Ser	Ile	Ser	Tyr
1535						1540					1545			
Asp	Leu	His	Thr	Glu	Gln	Cys	Ile	Ala	Asp	Lys	Ser	Ile	Ala	Asp
1550						1555					1560			
Cys	Val	Glu	Ala	Leu	Leu	Gly	Cys	Tyr	Leu	Thr	Ser	Cys	Gly	Glu
1565						1570					1575			
Arg	Ala	Ala	Gln	Leu	Phe	Leu	Cys	Ser	Leu	Gly	Ile	Lys	Val	Leu
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Pro	Val	Ile	Lys	Arg	Thr	Asp	Arg	Glu	Lys	Ala	Leu	Cys	Pro	Thr
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Arg	Glu	Asn	Phe	Asn	Ser	Gln	Gln	Lys	Asn	Leu	Ser	Val	Ser	Cys
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Ala	Ala	Ala	Ser	Val	Ala	Ser	Ser	Arg	Ser	Ser	Val	Leu	Lys	Asp
1625						1630					1635			
Ser	Glu	Tyr	Gly	Cys	Leu	Lys	Ile	Pro	Pro	Arg	Cys	Met	Phe	Asp
1640						1645					1650			
His	Pro	Asp	Ala	Asp	Lys	Thr	Leu	Asn	His	Leu	Ile	Ser	Gly	Phe
1655						1660					1665			
Glu	Asn	Phe	Glu	Lys	Lys	Ile	Asn	Tyr	Arg	Phe	Lys	Asn	Lys	Ala
1670						1675					1680			
Tyr	Leu	Leu	Gln	Ala	Phe	Thr	His	Ala	Ser	Tyr	His	Tyr	Asn	Thr

1685							1690								1695
Ile Thr Asp Cys Tyr Gln Arg	Leu Glu Phe Leu Gly Asp Ala Ile														
1700						1705					1710				
Leu Asp Tyr Leu Ile Thr Lys	His Leu Tyr Glu Asp Pro Arg Gln														
1715						1720					1725				
His Ser Pro Gly Val Leu Thr	Asp Leu Arg Ser Ala Leu Val Asn														
1730						1735					1740				
Asn Thr Ile Phe Ala Ser Leu	Ala Val Lys Tyr Asp Tyr His Lys														
1745						1750					1755				
Tyr Phe Lys Ala Val Ser Pro	Glu Leu Phe His Val Ile Asp Asp														
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Phe Val Gln Phe Gln Leu Glu	Lys Asn Glu Met Gln Gly Met Asp														
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Ser Glu Leu Arg Arg Ser Glu	Glu Asp Glu Glu Lys Glu Glu Asp														
1790						1795					1800				
Ile Glu Val Pro Lys Ala Met	Gly Asp Ile Phe Glu Ser Leu Ala														
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Gly Ala Ile Tyr Met Asp Ser	Gly Met Ser Leu Glu Thr Val Trp														
1820						1825					1830				
Gln Val Tyr Tyr Pro Met Met	Arg Pro Leu Ile Glu Lys Phe Ser														
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Ala Asn Val Pro Arg Ser Pro	Val Arg Glu Leu Leu Glu Met Glu														
1850						1855					1860				
Pro Glu Thr Ala Lys Phe Ser	Pro Ala Glu Arg Thr Tyr Asp Gly														
1865						1870					1875				
Lys Val Arg Val Thr Val Glu	Val Val Gly Lys Gly Lys Phe Lys														
1880						1885					1890				
Gly Val Gly Arg Ser Tyr Arg	Ile Ala Lys Ser Ala Ala Ala Arg														
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Ser

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1			5						10				15			
ccg	cgc	gac	ttt	cag	gtg	gag	cta	ctg	gcc	acc	gcc	tac	gag	cgg	aac	96
Pro	Arg	Asp	Phe	Gln	Val	Glu	Leu	Leu	Ala	Thr	Ala	Tyr	Glu	Arg	Asn	
			20					25					30			
acg	att	att	tgc	ctg	ggc	cat	cga	agt	tcc	aag	gag	ttt	ata	gcc	ctc	144
Thr	Ile	Ile	Cys	Leu	Gly	His	Arg	Ser	Ser	Lys	Glu	Phe	Ile	Ala	Leu	
			35				40					45				
aag	ctg	ctc	cag	gag	ctg	tgc	cgt	cga	gca	cgc	cga	cat	ggg	cgt	gtc	192
Lys	Leu	Leu	Gln	Glu	Leu	Ser	Arg	Arg	Ala	Arg	Arg	His	Gly	Arg	Val	
			50			55					60					
agt	gtc	tat	ctc	agt	tgc	gag	ggt	ggc	acc	agc	acg	gaa	cca	tgc	tcc	240
Ser	Val	Tyr	Leu	Ser	Cys	Glu	Val	Gly	Thr	Ser	Thr	Glu	Pro	Cys	Ser	
65					70					75					80	
atc	tac	acg	atg	ctc	acc	cac	ttg	act	gac	ctg	cgg	gtg	tgg	cag	gag	288
Ile	Tyr	Thr	Met	Leu	Thr	His	Leu	Thr	Asp	Leu	Arg	Val	Trp	Gln	Glu	
			85						90					95		
cag	ccg	gat	atg	caa	att	ccc	ttt	gat	cat	tgc	tgg	acg	gac	tat	cac	336
Gln	Pro	Asp	Met	Gln	Ile	Pro	Phe	Asp	His	Cys	Trp	Thr	Asp	Tyr	His	
			100					105					110			
gtt	tcc	atc	cta	cgg	cca	gag	gga	ttt	ctt	tat	ctg	ctc	gaa	act	cgc	384
Val	Ser	Ile	Leu	Arg	Pro	Glu	Gly	Phe	Leu	Tyr	Leu	Leu	Glu	Thr	Arg	
			115				120					125				
gag	ctg	ctg	ctg	agc	agc	gtc	gaa	ctg	atc	gtg	ctg	gaa	gat	tgt	cat	432
Glu	Leu	Leu	Leu	Ser	Ser	Val	Glu	Leu	Ile	Val	Leu	Glu	Asp	Cys	His	
			130			135						140				
gac	agc	gcc	ggt	tat	cag	agg	ata	agg	cct	ctg	ttc	gag	aat	cac	att	480
Asp	Ser	Ala	Val	Tyr	Gln	Arg	Ile	Arg	Pro	Leu	Phe	Glu	Asn	His	Ile	
145					150					155					160	
atg	cca	gcg	cca	ccg	gcg	gac	agg	cca	cgg	att	ctc	gga	ctc	gct	gga	528
Met	Pro	Ala	Pro	Pro	Ala	Asp	Arg	Pro	Arg	Ile	Leu	Gly	Leu	Ala	Gly	
					165				170					175		
ccg	ctg	cac	agc	gcc	gga	tgt	gag	ctg	cag	caa	ctg	agc	gcc	atg	ctg	576
Pro	Leu	His	Ser	Ala	Gly	Cys	Glu	Leu	Gln	Gln	Leu	Ser	Ala	Met	Leu	
			180					185					190			
gcc	acc	ctg	gag	cag	agt	gtg	ctt	tgc	cag	atc	gag	acg	gcc	agt	gat	624
Ala	Thr	Leu	Glu	Gln	Ser	Val	Leu	Cys	Gln	Ile	Glu	Thr	Ala	Ser	Asp	
			195				200					205				
att	gtc	acc	gtg	ttg	cgt	tac	tgt	tcc	cga	ccg	cac	gaa	tac	atc	gta	672
Ile	Val	Thr	Val	Leu	Arg	Tyr	Cys	Ser	Arg	Pro	His	Glu	Tyr	Ile	Val	
			210				215					220				
cag	tgc	gcc	ccc	ttc	gag	atg	gac	gaa	ctg	tcc	ctg	gtg	ctt	gcc	gat	720
Gln	Cys	Ala	Pro	Phe	Glu	Met	Asp	Glu	Leu	Ser	Leu	Val	Leu	Ala	Asp	
225					230					235				240		
gtg	ctc	aac	aca	cac	aag	tcc	ttt	tta	ttg	gac	cac	cgc	tac	gat	ccc	768
Val	Leu	Asn	Thr	His	Lys	Ser	Phe	Leu	Leu	Asp	His	Arg	Tyr	Asp	Pro	
				245					250					255		
tac	gaa	atc	tac	ggc	aca	gac	cag	ttt	atg	gac	gaa	ctg	aaa	gac	ata	816
Tyr	Glu	Ile	Tyr	Gly	Thr	Asp	Gln	Phe	Met	Asp	Glu	Leu	Lys	Asp	Ile	
			260						265					270		
ccc	gat	ccc	aag	gtg	gac	ccc	ctg	aac	gtc	atc	aac	tca	cta	ctg	gtc	864
Pro	Asp	Pro	Lys	Val	Asp	Pro	Leu	Asn	Val	Ile	Asn	Ser	Leu	Leu	Val	

1175		1180		1185		
cag ccg cta ttg gac gtg	gat cac acc agt gcg cgg tta aac ttc					3609
Gln Pro Leu Leu Asp Val	Asp His Thr Ser Ala Arg Leu Asn Phe					
1190		1195		1200		
ctc acg cca cga tac gtt	aat cgc aag ggc gtt gct ctg ccc act					3654
Leu Thr Pro Arg Tyr Val	Asn Arg Lys Gly Val Ala Leu Pro Thr					
1205		1210		1215		
agt tcg gag gag aca aag	cgg gca aag cgc gag aat ctc gaa cag					3699
Ser Ser Glu Glu Thr Lys	Arg Ala Lys Arg Glu Asn Leu Glu Gln					
1220		1225		1230		
aag cag atc ctt gtg cca	gag ctc tgc act gtg cat cca ttc ccc					3744
Lys Gln Ile Leu Val Pro	Glu Leu Cys Thr Val His Pro Phe Pro					
1235		1240		1245		
gcc tcc ttg tgg cga act	gcc gtg tgc ctg ccc tgc atc ctg tac					3789
Ala Ser Leu Trp Arg Thr	Ala Val Cys Leu Pro Cys Ile Leu Tyr					
1250		1255		1260		
cgc ata aat ggt ctt cta	ttg gcc gac gat att cgg aaa cag gtt					3834
Arg Ile Asn Gly Leu Leu	Leu Ala Asp Asp Ile Arg Lys Gln Val					
1265		1270		1275		
tct gcg gat ctg ggg ctg	gga agg caa cag atc gaa gat gag gat					3879
Ser Ala Asp Leu Gly Leu	Gly Arg Gln Gln Ile Glu Asp Glu Asp					
1280		1285		1290		
ttc gag tgg ccc atg ctg	gac ttt ggg tgg agt cta tcg gag gtg					3924
Phe Glu Trp Pro Met Leu	Asp Phe Gly Trp Ser Leu Ser Glu Val					
1295		1300		1305		
ctc aag aaa tcg cgg gag	tcc aaa caa aag gag tcc ctt aag gat					3969
Leu Lys Lys Ser Arg Glu	Ser Lys Gln Lys Glu Ser Leu Lys Asp					
1310		1315		1320		
gat act att aat ggc aaa	gac tta gct gat gtt gaa aag aaa ccg					4014
Asp Thr Ile Asn Gly Lys	Asp Leu Ala Asp Val Glu Lys Lys Pro					
1325		1330		1335		
act agc gag gag acc caa	cta gat aag gat tca aaa gac gat aag					4059
Thr Ser Glu Glu Thr Gln	Leu Asp Lys Asp Ser Lys Asp Asp Lys					
1340		1345		1350		
gtt gag aaa agt gct att	gaa cta atc att gag gga gag gag aag					4104
Val Glu Lys Ser Ala Ile	Glu Leu Ile Ile Glu Gly Glu Glu Lys					
1355		1360		1365		
ctg caa gag gct gat gac	ttc att gag ata ggc act tgg tca aac					4149
Leu Gln Glu Ala Asp Asp	Phe Ile Glu Ile Gly Thr Trp Ser Asn					
1370		1375		1380		
gat atg gcc gac gat ata	gct agt ttt aac caa gaa gac gac gac					4194
Asp Met Ala Asp Asp Ile	Ala Ser Phe Asn Gln Glu Asp Asp Asp					
1385		1390		1395		
gag gat gac gcc ttc cat	ctc cca gtt tta ccg gca aac gtt aag					4239
Glu Asp Asp Ala Phe His	Leu Pro Val Leu Pro Ala Asn Val Lys					
1400		1405		1410		
ttc tgt gat cag caa acg	cgc tac ggt tcg ccc aca ttt tgg gat					4284
Phe Cys Asp Gln Gln Thr	Arg Tyr Gly Ser Pro Thr Phe Trp Asp					
1415		1420		1425		
gtg agc aat ggc gaa agc	ggc ttc aag ggt cca aag agc agt cag					4329
Val Ser Asn Gly Glu Ser	Gly Phe Lys Gly Pro Lys Ser Ser Gln					
1430		1435		1440		
aat aag cag ggt ggc aag	ggc aaa gca aag ggt ccg gca aag ccc					4374
Asn Lys Gln Gly Gly Lys	Gly Lys Ala Lys Gly Pro Ala Lys Pro					
1445		1450		1455		
aca ttt aac tat tat gac	tcg gac aat tcg ctg ggt tcc agc tac					4419
Thr Phe Asn Tyr Tyr Asp	Ser Asp Asn Ser Leu Gly Ser Ser Tyr					

1460	gat gac gac gat aac gca ggt ccg ctc aat tac atg cat cac aac	1465	1470	4464
Asp Asp Asp Asp Asn Ala Gly Pro Leu Asn Tyr Met His His Asn				
1475		1480	1485	
tac agt tcg gat gac gac gat gtg gca gat gat atc gat gcg gga				4509
Tyr Ser Ser Asp Asp Asp Asp Val Ala Asp Asp Ile Asp Ala Gly				
1490		1495	1500	
cgc att gcg ttc acc tcc aag aat gaa gcg gag act att gaa acc				4554
Arg Ile Ala Phe Thr Ser Lys Asn Glu Ala Glu Thr Ile Glu Thr				
1505		1510	1515	
gca cag gaa gtg gaa aag cgc cag aag cag ctg tcc atc atc cag				4599
Ala Gln Glu Val Glu Lys Arg Gln Lys Gln Leu Ser Ile Ile Gln				
1520		1525	1530	
gcg acc aat gct aac gag cgg cag tat cag cag aca aag aac ctg				4644
Ala Thr Asn Ala Asn Glu Arg Gln Tyr Gln Gln Thr Lys Asn Leu				
1535		1540	1545	
ctc att gga ttc aat ttt aag cat gag gac cag aag gaa cct gcc				4689
Leu Ile Gly Phe Asn Phe Lys His Glu Asp Gln Lys Glu Pro Ala				
1550		1555	1560	
act ata aga tat gaa gaa tcc ata gct aag ctc aaa acg gaa ata				4734
Thr Ile Arg Tyr Glu Glu Ser Ile Ala Lys Leu Lys Thr Glu Ile				
1565		1570	1575	
gaa tcc ggc ggc atg ttg gtg ccg cac gac cag cag ttg gtt cta				4779
Glu Ser Gly Gly Met Leu Val Pro His Asp Gln Gln Leu Val Leu				
1580		1585	1590	
aaa aga agt gat gcc gct gag gct cag gtt gca aag gta tcg atg				4824
Lys Arg Ser Asp Ala Ala Glu Ala Gln Val Ala Lys Val Ser Met				
1595		1600	1605	
atg gag cta ttg aag cag ctg ctg ccg tat gta aat gaa gat gtg				4869
Met Glu Leu Leu Lys Gln Leu Leu Pro Tyr Val Asn Glu Asp Val				
1610		1615	1620	
ctg gcc aaa aag ctg ggt gat agg cgc gag ctt ctg ctg tcg gat				4914
Leu Ala Lys Lys Leu Gly Asp Arg Arg Glu Leu Leu Leu Ser Asp				
1625		1630	1635	
ttg gta gag cta aat gca gat tgg gta gcg cga cat gag cag gag				4959
Leu Val Glu Leu Asn Ala Asp Trp Val Ala Arg His Glu Gln Glu				
1640		1645	1650	
acc tac aat gta atg gga tgc gga gat agt ttt gac aac tat aac				5004
Thr Tyr Asn Val Met Gly Cys Gly Asp Ser Phe Asp Asn Tyr Asn				
1655		1660	1665	
gat cat cat cgg ctg aac ttg gat gaa aag caa ctg aaa ctg caa				5049
Asp His His Arg Leu Asn Leu Asp Glu Lys Gln Leu Lys Leu Gln				
1670		1675	1680	
tac gaa cga att gaa att gag cca cct act tcc acg aag gcc ata				5094
Tyr Glu Arg Ile Glu Ile Glu Pro Pro Thr Ser Thr Lys Ala Ile				
1685		1690	1695	
acc tca gcc ata tta cca gct ggc ttc agt ttc gat cga caa ccg				5139
Thr Ser Ala Ile Leu Pro Ala Gly Phe Ser Phe Asp Arg Gln Pro				
1700		1705	1710	
gat cta gtg ggc cat cca gga ccc agt ccc agc atc att ttg caa				5184
Asp Leu Val Gly His Pro Gly Pro Ser Pro Ser Ile Ile Leu Gln				
1715		1720	1725	
gcc ctc aca atg tcc aat gct aac gat ggc atc aat ctg gag cga				5229
Ala Leu Thr Met Ser Asn Ala Asn Asp Gly Ile Asn Leu Glu Arg				
1730		1735	1740	
ctg gag aca att gga gat tcc ttt cta aag tat gcc att acc acc				5274
Leu Glu Thr Ile Gly Asp Ser Phe Leu Lys Tyr Ala Ile Thr Thr				

1745	tac ttg tac atc acc tac	1750	gag aat gtg cac gag	1755	gga aaa cta agt	5319
	Tyr Leu Tyr Ile Thr Tyr		Glu Asn Val His Glu		Gly Lys Leu Ser	
1760		1765		1770		
cac ctg cgc tcc aag cag	ggt gcc aat ctc aat	ctc tat cgt ctg	5364			
His Leu Arg Ser Lys Gln	Val Ala Asn Leu Asn	Leu Tyr Arg Leu				
1775		1780		1785		
ggc aga cgt aag aga ctg	ggt gaa tat atg ata	gcc act aaa ttc	5409			
Gly Arg Arg Lys Arg Leu	Gly Glu Tyr Met Ile	Ala Thr Lys Phe				
1790		1795		1800		
gag ccg cac gac aat tgg	ctg cca ccc tgc tac	tac gtg cca aag	5454			
Glu Pro His Asp Asn Trp	Leu Pro Pro Cys Tyr	Tyr Val Pro Lys				
1805		1810		1815		
gag cta gag aag gcg ctc	atc gag gcg aag atc	ccc act cac cat	5499			
Glu Leu Glu Lys Ala Leu	Ile Glu Ala Lys Ile	Pro Thr His His				
1820		1825		1830		
tgg aag ctg gcc gat ctg	cta gac att aag aac	cta agc agt gtg	5544			
Trp Lys Leu Ala Asp Leu	Leu Asp Ile Lys Asn	Leu Ser Ser Val				
1835		1840		1845		
caa atc tgc gag atg gtt	cgc gaa aaa gcc gat	gcc ctg ggc ttg	5589			
Gln Ile Cys Glu Met Val	Arg Glu Lys Ala Asp	Ala Leu Gly Leu				
1850		1855		1860		
gag cag aat ggg ggt gcc	caa aat gga caa ctt	gac gac tcc aat	5634			
Glu Gln Asn Gly Gly Ala	Gln Asn Gly Gln Leu	Asp Asp Ser Asn				
1865		1870		1875		
gat agc tgc aat gat ttt	agc tgt ttt att ccc	tac aac ctt gtt	5679			
Asp Ser Cys Asn Asp Phe	Ser Cys Phe Ile Pro	Tyr Asn Leu Val				
1880		1885		1890		
tcg caa cac agc att ccg	gat aag tct att gcc	gat tgc gtc gaa	5724			
Ser Gln His Ser Ile Pro	Asp Lys Ser Ile Ala	Asp Cys Val Glu				
1895		1900		1905		
gcc ctc att gga gcc tat	ctc att gag tgc gga	ccc cga ggg gct	5769			
Ala Leu Ile Gly Ala Tyr	Leu Ile Glu Cys Gly	Pro Arg Gly Ala				
1910		1915		1920		
tta ctc ttt atg gcc tgg	ctg ggc gtg aga gtg	ctc cct atc aca	5814			
Leu Leu Phe Met Ala Trp	Leu Gly Val Arg Val	Leu Pro Ile Thr				
1925		1930		1935		
agg cag ttg gac ggg ggt	aac cag gag caa cga	ata ccc ggt agc	5859			
Arg Gln Leu Asp Gly Gly	Asn Gln Glu Gln Arg	Ile Pro Gly Ser				
1940		1945		1950		
aca aaa ccg aat gcc gaa	aat gtg gtc acc gtt	tac ggt gca tgg	5904			
Thr Lys Pro Asn Ala Glu	Asn Val Val Thr Val	Tyr Gly Ala Trp				
1955		1960		1965		
ccc acg ccg cgt agt cca	ctg ctg cac ttt gct	cca aat gct acg	5949			
Pro Thr Pro Arg Ser Pro	Leu Leu His Phe Ala	Pro Asn Ala Thr				
1970		1975		1980		
gag gag ctg gac cag tta	cta agc ggc ttt gag	gag ttt gag gag	5994			
Glu Glu Leu Asp Gln Leu	Leu Ser Gly Phe Glu	Glu Phe Glu Glu				
1985		1990		1995		
agt ttg gga tac aag ttc	cgg gat cgg tcg tac	ctg ttg caa gcc	6039			
Ser Leu Gly Tyr Lys Phe	Arg Asp Arg Ser Tyr	Leu Leu Gln Ala				
2000		2005		2010		
atg aca cat gcc agt tac	acg ccc aat cga ttg	acg gat tgc tat	6084			
Met Thr His Ala Ser Tyr	Thr Pro Asn Arg Leu	Thr Asp Cys Tyr				
2015		2020		2025		
cag cgt ctg gag ttc ctg	ggc gat gct gtt cta	gat tac ctc att	6129			
Gln Arg Leu Glu Phe Leu	Gly Asp Ala Val Leu	Asp Tyr Leu Ile				

2030	2035	2040	
acg cgg cat tta tac gaa gat	ccc cgc cag cat tct	cca ggc gca	6174
Thr Arg His Leu Tyr Glu Asp	Pro Arg Gln His Ser	Pro Gly Ala	
2045	2050	2055	
tta acg gat ttg cgg tca gca	ctg gtg aat aat aca	ata ttc gcc	6219
Leu Thr Asp Leu Arg Ser Ala	Leu Val Asn Asn Thr	Ile Phe Ala	
2060	2065	2070	
tcc ctg gct gtt cgc cat ggc	ttc cac aag ttc ttc	cgg cac ctc	6264
Ser Leu Ala Val Arg His Gly	Phe His Lys Phe Phe	Arg His Leu	
2075	2080	2085	
tcg ccg ggc ctt aac gat gtg	att gac cgt ttt gtg	cgg atc cag	6309
Ser Pro Gly Leu Asn Asp Val	Ile Asp Arg Phe Val	Arg Ile Gln	
2090	2095	2100	
cag gag aat gga cac tgc atc	agt gag gag tac tac	tta ttg tcc	6354
Gln Glu Asn Gly His Cys Ile	Ser Glu Glu Tyr Tyr	Leu Leu Ser	
2105	2110	2115	
gag gag gag tgc gat gac gcc	gag gac gtt gag gtg	ccc aag gca	6399
Glu Glu Glu Cys Asp Asp Ala	Glu Asp Val Glu Val	Pro Lys Ala	
2120	2125	2130	
ttg ggc gac gtt ttc gag tcg	atc gca ggt gcc att	ttt ctc gac	6444
Leu Gly Asp Val Phe Glu Ser	Ile Ala Gly Ala Ile	Phe Leu Asp	
2135	2140	2145	
tca aac atg tcg ctg gac gtg	gtt tgg cac gta tat	agc aac atg	6489
Ser Asn Met Ser Leu Asp Val	Val Trp His Val Tyr	Ser Asn Met	
2150	2155	2160	
atg agc ccg gag atc gag cag	ttc agc aac tca gtg	cca aaa tcg	6534
Met Ser Pro Glu Ile Glu Gln	Phe Ser Asn Ser Val	Pro Lys Ser	
2165	2170	2175	
ccc att ccg gag ctc ctc gag	ctg gag ccg gaa acc	gcc aag ttc	6579
Pro Ile Arg Glu Leu Leu Glu	Leu Glu Pro Glu Thr	Ala Lys Phe	
2180	2185	2190	
ggc aag ccc gag aag ctg gcg	gat ggg cga cgg gtg	cgc gtt acc	6624
Gly Lys Pro Glu Lys Leu Ala	Asp Gly Arg Arg Val	Arg Val Thr	
2195	2200	2205	
gtg gat gtc ttc tgc aaa gga	acc ttc cgt ggc atc	gga cgc aac	6669
Val Asp Val Phe Cys Lys Gly	Thr Phe Arg Gly Ile	Gly Arg Asn	
2210	2215	2220	
tat cgc att gcc aag tgc acg	gcg gcc aaa tgc gca	ttg cgc caa	6714
Tyr Arg Ile Ala Lys Cys Thr	Ala Ala Lys Cys Ala	Leu Arg Gln	
2225	2230	2235	
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Leu Lys Lys Gln Gly Leu Ile	Ala Lys Lys Asp		
2240	2245		

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645

650

655

Ser Ser Gly Ser Asp Pro Tyr Thr Phe Gly Thr Ala Arg Gly Thr Val
 660 665 670

Lys Ile Leu Asn Pro Glu Val Phe Ser Lys Gln Pro Pro Thr Ala Cys
 675 680 685

Asp Ile Lys Leu Gln Glu Ile Gln Asp Glu Leu Pro Ala Ala Ala Gln
 690 695 700

Leu Asp Thr Ser Asn Ser Ser Asp Glu Ala Val Ser Met Ser Asn Thr
 705 710 715 720

Ser Pro Ser Glu Ser Ser Thr Glu Gln Lys Ser Arg Arg Phe Gln Cys
 725 730 735

Glu Leu Ser Ser Leu Thr Glu Pro Glu Asp Thr Ser Asp Thr Thr Ala
 740 745 750

Glu Ile Asp Thr Ala His Ser Leu Ala Ser Thr Thr Lys Asp Leu Val
 755 760 765

His Gln Met Ala Gln Tyr Arg Glu Ile Glu Gln Met Leu Leu Ser Lys
 770 775 780

Cys Ala Asn Thr Glu Pro Pro Glu Gln Glu Gln Ser Glu Ala Glu Arg
 785 790 795 800

Phe Ser Ala Cys Leu Ala Ala Tyr Arg Pro Lys Pro His Leu Leu Thr
 805 810 815

Gly Ala Ser Val Asp Leu Gly Ser Ala Ile Ala Leu Val Asn Lys Tyr
 820 825 830

Cys Ala Arg Leu Pro Ser Asp Thr Phe Thr Lys Leu Thr Ala Leu Trp
 835 840 845

Arg Cys Thr Arg Asn Glu Arg Ala Gly Val Thr Leu Phe Gln Tyr Thr
 850 855 860

Leu Arg Leu Pro Ile Asn Ser Pro Leu Lys His Asp Ile Val Gly Leu
 865 870 875 880

Pro Met Pro Thr Gln Thr Leu Ala Arg Arg Leu Ala Ala Leu Gln Ala
 885 890 895

Cys Val Glu Leu His Arg Ile Gly Glu Leu Asp Asp Gln Leu Gln Pro
 900 905 910

Ile Gly Lys Glu Gly Phe Arg Ala Leu Glu Pro Asp Trp Glu Cys Phe
 915 920 925

Glu Leu Glu Pro Glu Asp Glu Gln Ile Val Gln Leu Ser Asp Glu Pro
 930 935 940

Arg Pro Gly Thr Thr Lys Arg Arg Gln Tyr Tyr Tyr Lys Arg Ile Ala

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Tyr	Phe	Ile	Gln	Leu	Thr	Leu	Gln	Cys	Pro	Ile	Pro	Glu	Glu	Gln	Asn
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Thr	Arg	Gly	Arg	Lys	Ile	Tyr	Pro	Pro	Glu	Asp	Ala	Gln	Gln	Gly	Phe
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Gly	Ile	Leu	Thr	Thr	Lys	Arg	Ile	Pro	Lys	Leu	Ser	Ala	Phe	Ser	
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Gly	Phe	Leu	Asn	Tyr	Thr	Phe	Thr	Asn	Val	Leu	Arg	Leu	Gln	Lys	
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	1070					1075					1080				
Ile	Val	Pro	Thr	Val	Lys	Ala	Pro	Ala	Gly	Gly	Lys	His	Ile	Asp	
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Trp	Gln	Phe	Leu	Glu	Leu	Ile	Gln	Ala	Asn	Gly	Asn	Thr	Met	Pro	
	1100					1105					1110				
Arg	Ala	Val	Pro	Asp	Glu	Glu	Arg	Gln	Ala	Gln	Pro	Phe	Asp	Pro	
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Asp	Gln	Pro	Gln	Tyr	Phe	Tyr	Val	Ala	Glu	Ile	Cys	Pro	His	Leu	
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Ser	Pro	Leu	Ser	Cys	Phe	Pro	Gly	Asp	Asn	Tyr	Arg	Thr	Phe	Lys	
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His	Tyr	Tyr	Leu	Val	Lys	Tyr	Gly	Leu	Thr	Ile	Gln	Asn	Thr	Ser	
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	1190					1195					1200				
Leu	Thr	Pro	Arg	Tyr	Val	Asn	Arg	Lys	Gly	Val	Ala	Leu	Pro	Thr	
	1205					1210					1215				
Ser	Ser	Glu	Glu	Thr	Lys	Arg	Ala	Lys	Arg	Glu	Asn	Leu	Glu	Gln	
	1220					1225					1230				
Lys	Gln	Ile	Leu	Val	Pro	Glu	Leu	Cys	Thr	Val	His	Pro	Phe	Pro	

1235						1240								1245
Ala Ser	Leu Trp	Arg Thr	Ala Val	Cys Leu	Pro Cys	Ile Leu	Tyr							
1250			1255			1260								
Arg Ile	Asn Gly	Leu Leu	Leu Ala	Asp Asp	Ile Arg	Lys Gln	Val							
1265			1270			1275								
Ser Ala	Asp Leu	Gly Leu	Gly Arg	Gln Gln	Ile Glu	Asp Glu	Asp							
1280			1285			1290								
Phe Glu	Trp Pro	Met Leu	Asp Phe	Gly Trp	Ser Leu	Ser Glu	Val							
1295			1300			1305								
Leu Lys	Lys Ser	Arg Glu	Ser Lys	Gln Lys	Glu Ser	Leu Lys	Asp							
1310			1315			1320								
Asp Thr	Ile Asn	Gly Lys	Asp Leu	Ala Asp	Val Glu	Lys Lys	Pro							
1325			1330			1335								
Thr Ser	Glu Glu	Thr Gln	Leu Asp	Lys Asp	Ser Lys	Asp Asp	Lys							
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Val Glu	Lys Ser	Ala Ile	Glu Leu	Ile Ile	Glu Gly	Glu Glu	Lys							
1355			1360			1365								
Leu Gln	Glu Ala	Asp Asp	Phe Ile	Glu Ile	Gly Thr	Trp Ser	Asn							
1370			1375			1380								
Asp Met	Ala Asp	Asp Ile	Ala Ser	Phe Asn	Gln Glu	Asp Asp	Asp							
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Glu Asp	Asp Ala	Phe His	Leu Pro	Val Leu	Pro Ala	Asn Val	Lys							
1400			1405			1410								
Phe Cys	Asp Gln	Gln Thr	Arg Tyr	Gly Ser	Pro Thr	Phe Trp	Asp							
1415			1420			1425								
Val Ser	Asn Gly	Glu Ser	Gly Phe	Lys Gly	Pro Lys	Ser Ser	Gln							
1430			1435			1440								
Asn Lys	Gln Gly	Gly Lys	Gly Lys	Ala Lys	Gly Pro	Ala Lys	Pro							
1445			1450			1455								
Thr Phe	Asn Tyr	Tyr Asp	Ser Asp	Asn Ser	Leu Gly	Ser Ser	Tyr							
1460			1465			1470								
Asp Asp	Asp Asp	Asn Ala	Gly Pro	Leu Asn	Tyr Met	His His	Asn							
1475			1480			1485								
Tyr Ser	Ser Asp	Asp Asp	Asp Val	Ala Asp	Asp Ile	Asp Ala	Gly							
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Arg Ile	Ala Phe	Thr Ser	Lys Asn	Glu Ala	Glu Thr	Ile Glu	Thr							
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Ala Gln	Glu Val	Glu Lys	Arg Gln	Lys Gln	Leu Ser	Ile Ile	Gln							

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Lys	Arg	Ser	Asp	Ala	Ala	Glu	Ala	Gln	Val	Ala	Lys	Val	Ser	Met	
1595						1600					1605				
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1775						1780					1785				
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Glu	Pro	His	Asp	Asn	Trp	Leu	Pro	Pro	Cys	Tyr	Tyr	Val	Pro	Lys	

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Glu	Leu	Glu	Lys	Ala	Leu	Ile	Glu	Ala	Lys	Ile	Pro	Thr	His	His
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Trp	Lys	Leu	Ala	Asp	Leu	Leu	Asp	Ile	Lys	Asn	Leu	Ser	Ser	Val
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Gln	Ile	Cys	Glu	Met	Val	Arg	Glu	Lys	Ala	Asp	Ala	Leu	Gly	Leu
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1880						1885					1890			
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1895						1900					1905			
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1910						1915					1920			
Leu	Leu	Phe	Met	Ala	Trp	Leu	Gly	Val	Arg	Val	Leu	Pro	Ile	Thr
1925						1930					1935			
Arg	Gln	Leu	Asp	Gly	Gly	Asn	Gln	Glu	Gln	Arg	Ile	Pro	Gly	Ser
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1955						1960					1965			
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1985						1990					1995			
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2030						2035					2040			
Thr	Arg	His	Leu	Tyr	Glu	Asp	Pro	Arg	Gln	His	Ser	Pro	Gly	Ala
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Ser	Pro	Gly	Leu	Asn	Asp	Val	Ile	Asp	Arg	Phe	Val	Arg	Ile	Gln

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 Gln Pro Gln Gln Leu Gln Gln Pro Gln Gln Leu Gln Gln Pro Gln Gln
 35 40 45
 Leu Gln Gln Pro Gln Gln Gln Gln Gln Gln Gln Pro His Gln Gln Gln
 50 55 60
 Gln Gln Ser Ser Arg Gln Gln Pro Ser Thr Ser Ser Gly Gly Ser Arg
 65 70 75 80
 Ala Ser Gly Phe Gln Gln Gly Gly Gln Gln Lys Ser Gln Asp Ala
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 Glu Gly Trp Thr Ala Gln Lys Lys Gln Gly Lys Gln Gln Val Gln Gly

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Trp Thr Lys Gln Gly Gln Gln Gly Gly His Gln Gln Gly Arg Gln Gly	115		120		125
Gln Asp Gly Gly Tyr Gln Gln Arg Pro Pro Gly Gln Gln Gln Gly Gly	130		135		140
His Gln Gln Gly Arg Gln Gly Gln Glu Gly Gly Tyr Gln Gln Arg Pro	145		150		155
Pro Gly Gln Gln Gln Gly Gly His Gln Gln Gly Arg Gln Gly Gln Glu		165		170	175
Gly Gly Tyr Gln Gln Arg Pro Ser Gly Gln Gln Gln Gly Gly His Gln		180		185	190
Gln Gly Arg Gln Gly Gln Glu Gly Gly Tyr Gln Gln Arg Pro Pro Gly		195		200	205
Gln Gln Gln Gly Gly His Gln Gln Gly Arg Gln Gly Gln Glu Gly Gly		210		215	220
Tyr Gln Gln Arg Pro Ser Gly Gln Gln Gln Gly Gly His Gln Gln Gly		225		230	235
Arg Gln Gly Gln Glu Gly Gly Tyr Gln Gln Arg Pro Ser Gly Gln Gln		245		250	255
Gln Gly Gly His Gln Gln Gly Arg Gln Gly Gln Glu Gly Gly Tyr Gln		260		265	270
Gln Arg Pro Ser Gly Gln Gln Gln Gly Gly His Gln Gln Gly Arg Gln		275		280	285
Gly Gln Glu Gly Gly Tyr Gln Gln Arg Pro Pro Gly Gln Gln Pro Asn		290		295	300
Gln Thr Gln Ser Gln Gly Gln Tyr Gln Ser Arg Gly Pro Pro Gln Gln		305		310	315
Gln Gln Ala Ala Pro Leu Pro Leu Pro Pro Gln Pro Ala Gly Ser Ile		325		330	335
Lys Arg Gly Thr Ile Gly Lys Pro Gly Gln Val Gly Ile Asn Tyr Leu		340		345	350
Asp Leu Asp Leu Ser Lys Met Pro Ser Val Ala Tyr His Tyr Asp Val		355		360	365
Lys Ile Met Pro Glu Arg Pro Lys Lys Phe Tyr Arg Gln Ala Phe Glu		370		375	380
Gln Phe Arg Val Asp Gln Leu Gly Gly Ala Val Leu Ala Tyr Asp Gly		385		390	395
Lys Ala Ser Cys Tyr Ser Val Asp Lys Leu Pro Leu Asn Ser Gln Asn					400

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Pro	Glu	Val	Thr	Val	Thr	Asp	Arg	Asn	Gly	Arg	Thr	Leu	Arg	Tyr	Thr
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Ile	Glu	Ile	Lys	Glu	Thr	Gly	Asp	Ser	Thr	Ile	Asp	Leu	Lys	Ser	Leu
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Thr	Thr	Tyr	Met	Asn	Asp	Arg	Ile	Phe	Asp	Lys	Pro	Met	Arg	Ala	Met
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Arg	Val	Gly	Arg	Ser	Phe	Phe	Lys	Met	Ser	Asp	Pro	Asn	Asn	Arg	His
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Glu	Leu	Asp	Asp	Gly	Tyr	Glu	Ala	Leu	Val	Gly	Leu	Tyr	Gln	Ala	Phe
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Lys	Ala	Lys	Ile	Asn	Asn	Thr	Thr	Asn	Leu	Asp	Tyr	Ser	Arg	Arg	Phe
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Leu	Glu	Pro	Phe	Leu	Arg	Gly	Ile	Asn	Val	Val	Tyr	Thr	Pro	Pro	Gln
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Ser	Phe	Gln	Ser	Ala	Pro	Arg	Val	Tyr	Arg	Val	Asn	Gly	Leu	Ser	Arg
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Ala	Pro	Ala	Ser	Ser	Glu	Thr	Phe	Glu	His	Asp	Gly	Lys	Lys	Val	Thr
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Ile	Glu	Leu	Cys	Ser	Ile	Glu	Glu	Gly	Gln	Ala	Leu	Asn	Arg	Lys	Asp
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Gly	Ala	Thr	Gln	Val	Ala	Asn	Met	Ile	Lys	Tyr	Ala	Ala	Thr	Ser	Thr
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Asn	Val	Arg	Lys	Arg	Lys	Ile	Met	Asn	Leu	Leu	Gln	Tyr	Phe	Gln	His
		675					680						685		
Asn	Leu	Asp	Pro	Thr	Ile	Ser	Arg	Phe	Gly	Ile	Arg	Ile	Ala	Asn	Asp
690						695					700				
Phe	Ile	Val	Val	Ser	Thr	Arg	Val	Leu	Ser	Pro	Pro	Gln	Val	Glu	Tyr

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Gly Met Lys Phe Leu Glu Pro Lys Pro Lys Ala His Lys Cys Ala Val		740		745		750
Leu Tyr Cys Asp Pro Arg Ser Gly Arg Lys Met Asn Tyr Thr Gln Leu		755		760		765
Asn Asp Phe Gly Asn Leu Ile Ile Ser Gln Gly Lys Ala Val Asn Ile		770		775		780
Ser Leu Asp Ser Asp Val Thr Tyr Arg Pro Phe Thr Asp Asp Glu Arg		785		790		795
Ser Leu Asp Thr Ile Phe Ala Asp Leu Lys Arg Ser Gln His Asp Leu		805		810		815
Ala Ile Val Ile Ile Pro Gln Phe Arg Ile Ser Tyr Asp Thr Ile Lys		820		825		830
Gln Lys Ala Glu Leu Gln His Gly Ile Leu Thr Gln Cys Ile Lys Gln		835		840		845
Phe Thr Val Glu Arg Lys Cys Asn Asn Gln Thr Ile Gly Asn Ile Leu		850		855		860
Leu Lys Ile Asn Ser Lys Leu Asn Gly Ile Asn His Lys Ile Lys Asp		865		870		875
Asp Pro Arg Leu Pro Met Met Lys Asn Thr Met Tyr Ile Gly Ala Asp		885		890		895
Val Thr His Pro Ser Pro Asp Gln Arg Glu Ile Pro Ser Val Val Gly		900		905		910
Val Ala Ala Ser His Asp Pro Tyr Gly Ala Ser Tyr Asn Met Gln Tyr		915		920		925
Arg Leu Gln Arg Gly Ala Leu Glu Glu Ile Glu Asp Met Phe Ser Ile		930		935		940
Thr Leu Glu His Leu Arg Val Tyr Lys Glu Tyr Arg Asn Ala Tyr Pro		945		950		955
Asp His Ile Ile Tyr Tyr Arg Asp Gly Val Ser Asp Gly Gln Phe Pro		965		970		975
Lys Ile Lys Asn Glu Glu Leu Arg Cys Ile Lys Gln Ala Cys Asp Lys		980		985		990
Val Gly Cys Lys Pro Lys Ile Cys Cys Val Ile Val Val Lys Arg His		995		1000		1005
His Thr Arg Phe Phe Pro Ser Gly Asp Val Thr Thr Ser Asn Lys						

